

The Case for Carbon Monoxide Surveillance

*EPHT National Conference,
Atlanta Georgia
August 10, 2006*

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CO poisoning: An **old**, new and emerging public health issue

■ CO is highly toxic gas

- ◆ Odorless, colorless gas
- ◆ Produced as a byproduct of combustion

■ History of CO discovery

- ◆ 13th century: Poison associated with burning carbon-based fuels
- ◆ 16th century: CO identified as a unique gas

CO poisoning: An old, new and emerging public health issue

- Today in US
 - ◆ 15,200 treated annually in EDs¹
 - ◆ 800 deaths annually ²
- Newly recognized
 - ◆ Disaster-related injury and death
 - ◆ Large scale power outages
 - ◆ New exposure sources:
 - ◆ Power-boat engines
 - ◆ Others?

1. CDC. Unintentional non-fire-related carbon monoxide exposures – United States, 2001-2002. MMWR: Jan.21 2005 / 54(02);36-39

2. Cobb N, Etzel RA. Unintentional carbon monoxide-related deaths in the United States 1979 through 1988. JAMA 1991;266:659-63

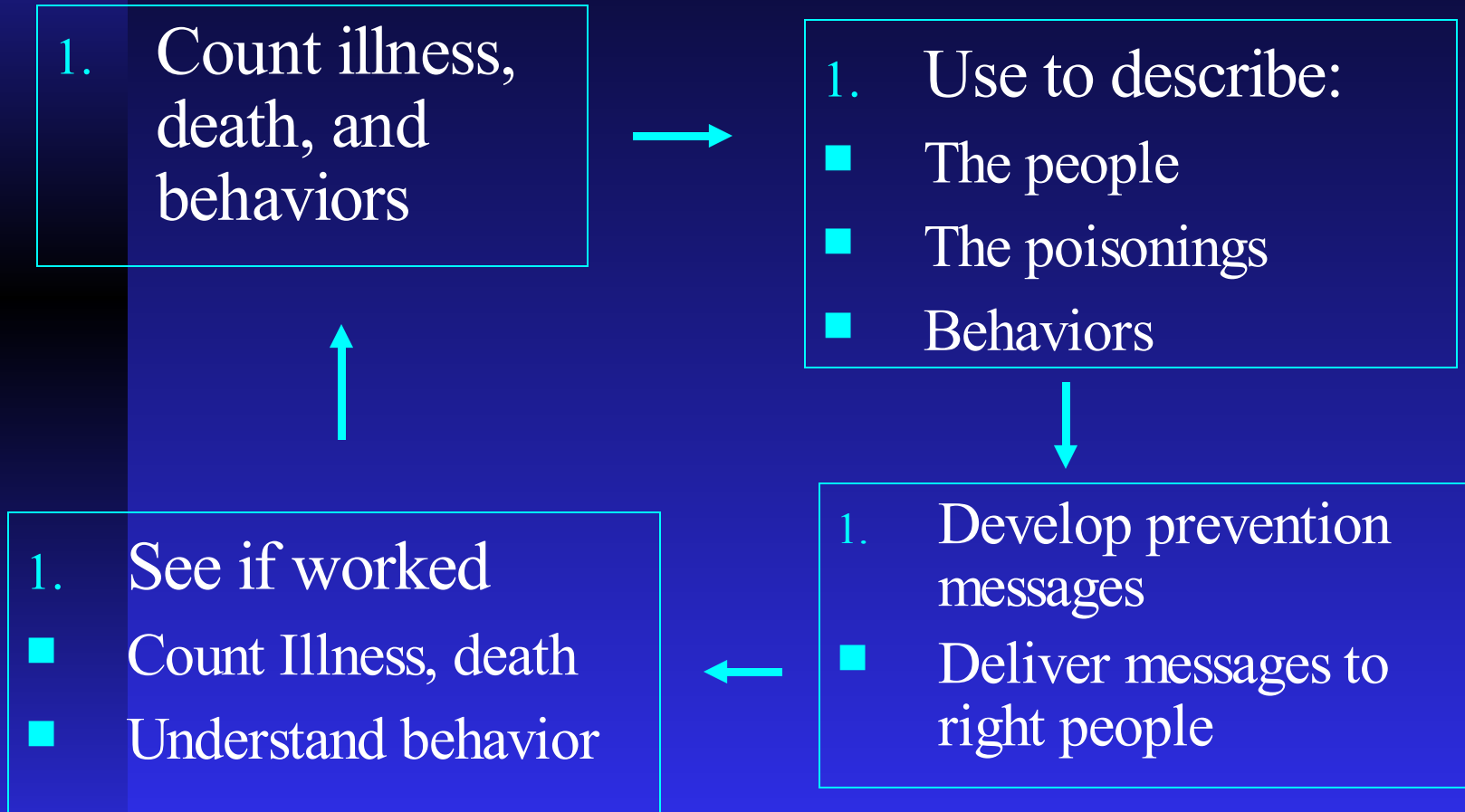
CO poisoning: An old and emerging public health issue

- Long-term medical complications – high exposures
 - ◆ Neurological?
 - ◆ Cardiac?
- Long-term exposure to low doses
 - ◆ Neurological?
 - ◆ Cardiac?

CO: The case for surveillance

- Evidence based prevention strategies
 - ◆ Correct installation/ maintenance potential CO emitting devices
 - ◆ CO detectors
 - ◆ Legislation/regulation
 - ◆ CO emissions
 - ◆ CO detectors
- So, why AREN'T we conducting public health surveillance?

Why do surveillance anyway



What to count?

Case definition:

- 1998 CSTE definition, for CO included:
 - ◆ Confirmed and probable cases
- We then excluded cases indicating:
 - ◆ Non-Maine residents
 - ◆ Fire-related
 - ◆ Intentional injury

What data did we use?

1. Non-fatal poisonings

- Maine hospital data

2. Death

- Death certificate files

3. Knowledge and prevention behaviors

- State-wide survey of health behaviors

4. Qualitative information

- Newspaper search engine

Data Sources: Hospital data

- Hospital billing records available electronically
 - ◆ Hospital discharge data
 - ◆ Emergency department
 - ◆ Hospital-based outpatient
- Reported quarterly
 - ◆ 12-18 month delay

Data Challenges

- Getting the data
 - ◆ Developed a formal data sharing agreement
 - ◆ ONE contact person per organization
- Working with the data was initially challenging
 - ◆ Significant initial time investment
 - ◆ Established log of issues/resolutions

Data sources: Hospital visits

DATA ELEMENTS INCLUDED:

Demographics

Age / DOB
Sex
Zipcode (Res.)*
County (Res.)
Encrypted medical
record number

Diagnosis

Principal diagnosis ¹
Admitting diagnosis ¹
Secondary diagnoses(1-9)¹

Hospitalization

Admission date
Payer
Source of admission
Discharge Date

DATA ELEMENTS NOT INCLUDED:

Name
Street address
Race or ethnicity

Data Uses - Presentation

- Describe the cases:
 - ◆ Who? When? Where?
- Describe the poisonings
 - ◆ What? (Source of the CO poisoning)
 - ◆ Where did it happen?
- Describe the behaviors
 - ◆ CO detector present?
 - ◆ Use of alternative heating methods?

Describe the cases: Who?

All hospital visits - 1999 To 2003:

Total 740 cases identified;

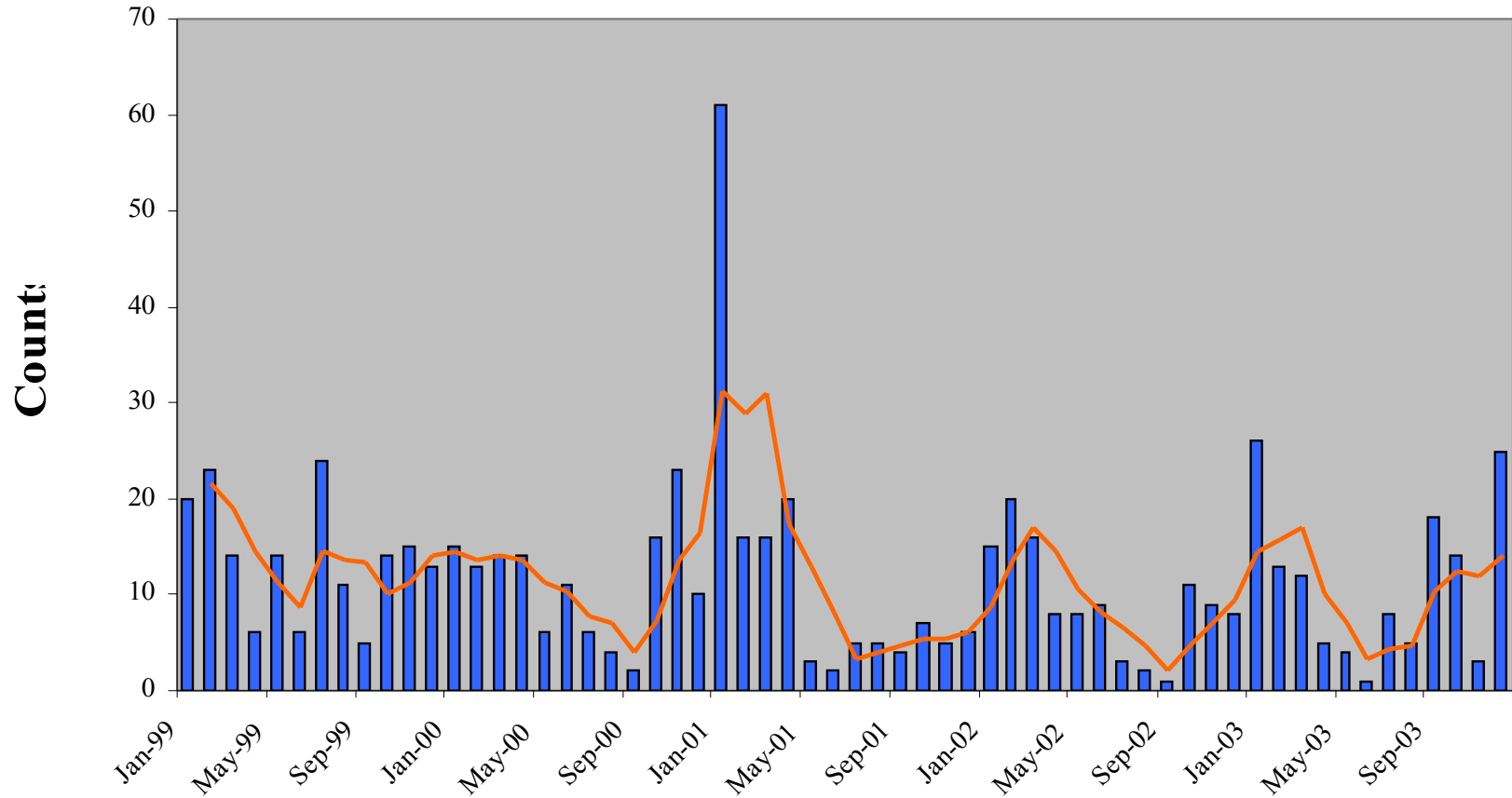
- ◆ 47 (6. %) hospitalized
- ◆ 693 (94%) in an outpatient setting
- ◆ Subset of both seen in ED
= 442 (60%)

Describe the cases: Who?

Average annual rates / 100,000

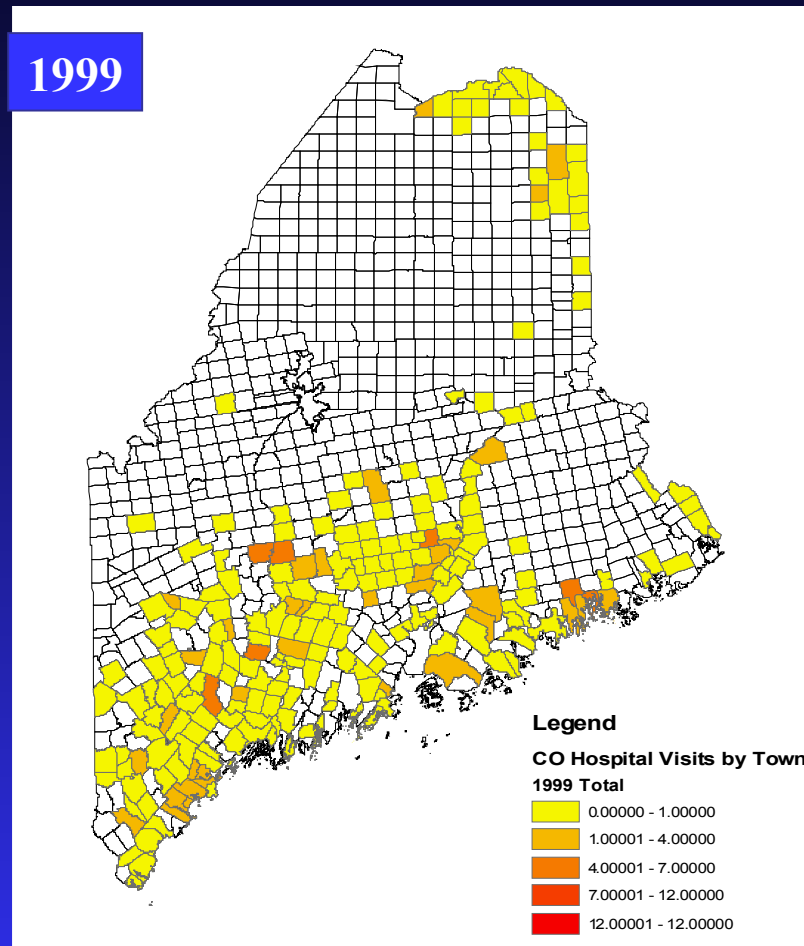
	OUT PATIENT			HOSPITALIZATIONS		
	N	Crude Rate	95% CI *	N	Crude Rate	95% CI **
All	693	10.8	(10.0 - 11.6)	47	0.7	(0.5 - 1.0)
BY AGE GROUP						
0-17	140	9.6	(8.0 - 11.2)	0	.	..
18-34	233	17.4	(15.2 - 19.6)	9	0.7	(0.3 - 1.3)
35-64	290	10.8	(9.6 - 12.0)	25	0.9	(0.6 - 1.4)
>=65	30	3.3	(2.1 - 4.5)	13	1.4	(0.7 - 2.4)
BY SEX						
Male	380	11.5	(10.3 - 12.7)	33	1.0	(0.7 - 1.4)
Female	313	10	(8.9 - 11.1)	14	0.4	(0.2 - 0.8)

Describe the cases: When?



* Orange line shows the three-month moving average

Describe the cases: Where?



Describe the poisonings What?

Source of the CO poisoning

Frequency of Carbon Monoxide Exposure-related E-codes Accidental poisoning by....

	OUT PATIENT		HOSPITALIZATIONS	
	N	(%)	N	(%)
Any CO-related E-code	435	(62.8)	27	(57.5)
E868.2 : Motor vehicle gas exhaust	132	(19.1)	11	(23.4)
E868.3 : CO domestic fuel	85	(12.3)	4	(8.5)
E868.8 : .CO other sources	90	(13.0)	8	(17.0)

Describe the poisonings

Where did it happen?

- Exposures at work:
 - ◆ 23% occurred at a work place
 - ◆ Worker's Compensation payment:
 - ◆ 13% identified (over half)
 - ◆ Remainder by E-codes for place of occurrence
 - ◆ E849.1 through E849.3

Describe the poisonings:

Where did it happen

Newspaper search engine

- Circumstances of exposure:
 - ◆ 2 work-place exposures due to forklifts
 - ◆ One in a restaurant
- Demographic information:
 - ◆ Race, ethnicity
 - ◆ Confirm other (gender)
- Clinical information
 - ◆ Deaths
 - ◆ Treatment

Describe the behaviors

- Statewide survey of health behaviors
 - ◆ BRFSS
- 9 questions
 - ◆ CO monitor presence in household (3)
 - ◆ Generators (6)
 - ◆ Use, Placement, Ownership

BRFSS: CO Detector in Household

- Have a CO detector in the household?
 - ◆ 33.0%
 - ◆ > 95% have a smoke detector
- Less likely to have a CO detector: ($P = < 0.001$)
 - ◆ Older - 65+
 - ◆ Lower income
 - ◆ Female head of household
 - ◆ Not married or living as a couple
- More likely to have a CO detector: ($P = < 0.001$)
 - ◆ Have children
 - ◆ Own a generator

Data sources NOT assessed

- Poison control center data
- Hyperbaric chambers
- E.M.S. records
- Fire department records

Going National – Challenges, Approaches

- Data sources not designed for this use
- Health outcome only
- Comparability with other states
 - ◆ 90% of states have hospitalization
 - ◆ 50% ED
 - ◆ Few have other outpatient visits
- Lack of national standards for surveillance
 - ◆ National Workgroup on CO surveillance

Approach to resolve

- Recognized other EPHT grantees doing or interested in CO work
- The National Workgroup on Carbon Monoxide Surveillance
 - ◆ Formed in April 2005

National Workgroup on Carbon Monoxide Surveillance

Goals:

2. Build a system for CO surveillance
 - National
 - Sustainable
3. Standardize methodology CO surveillance
4. Promote programs for prevention and education

National Workgroup on Carbon Monoxide Surveillance

Structure:

- 2 Co-chairs
- Members
 - ◆ EPHT grantees
 - ◆ Academics/clinicians
 - ◆ Other CDC partners
- Monthly meetings
 - ◆ In person when possible
- Work plan and projects –
 - ◆ Subgroups to do the work

National Workgroup on Carbon Monoxide Surveillance

Accomplishments:

- *Carbon Monoxide: A Model Environmental Public Health Indicator*
- Collaborating with CDC:
 - ◆ Evaluation of national case definitions
 - ◆ National conference
 - ◆ Held July 12-13th, 2006
- CO surveillance at CSTE (June 2006)
 - ◆ Conducted a session
 - ◆ 2 roundtable discussions

Next Steps: Nationally

- Continue working toward national surveillance
 - ◆ Work with CDC on national standards
- Expand workgroup membership
- Collaborate with other partners to:
 - ◆ Promote development of model legislation
 - ◆ Requirement for CO detectors
 - ◆ Reduce CO emissions
 - e.g. Boat engines
 - ◆ Improve labeling on potential CO emitting devices
 - ◆ e.g. Generators

Conclusions

- Conducting EPHT for CO poisoning is:
 - ◆ Feasible
 - ◆ Useful
 - ◆ Fills an existing public health gap
 - ◆ An important EPHT priority
- National workgroup should serve as a model for other EPHT content areas
 - ◆ Collaborations
 - ◆ Product-oriented
 - ◆ Structured

